Image 1 of AF 1623

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appl. No.	: 09/775,760	Confirmation No. 5787
Applicant (s)	: Mallon et. al.	
Filed	: February 2, 2001	
TC/A.U.	: 1623	
Examiner	: Devesh Khare	
Title	: METHOD OF PREPARING MODIFIED CELLULOSE ETHER	
Docket No.	: UC 17795-2	
Customer No.	: 00109	

I HEREBY CERTIFY THAT THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL WITH SUFFICIENT POSTAGE IN AN ENVELOPE ADDRESSED TO: ASSISTANT COMMISSIONER FOR PATENTS, P.O. BOX 1450, ALEXANDRIA, VA 22313-1450, ON:

January 26, 2004
DATE OF DEPOSIT

Abby Doyle
PRINT OR TYPE NAME OF PERSON SIGNING CERTIFICATE

Abby Doyle
SIGNATURE OF PERSON SIGNING CERTIFICATE

January 26, 2004
DATE OF SIGNATURE

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

BRIEF FOR APPELLANT - FEE SHEET

This is an appeal to the Board of Appeals from the action of the Primary Examiner finally rejecting Claims 33-51, in the above-identified patent application.

Please charge the $330.00 fee to our Deposit Account No. 04-1512. If this amount is incorrect, please charge or credit our account accordingly. One original and two duplicate copies of this sheet are enclosed.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
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BRIEF FOR APPELLANT

This is an appeal to the Board of Appeals from the decision dated September 15, 2003 of the Primary Examiner rejecting Claims 33-51, all pending claims in the above identified application.

REAL PARTY IN INTEREST

The Real Party in Interest in this Appeal is Union Carbide Corporation.

RELATED APPEALS AND INTERFERENCES

At this time there are no related appeals or interferences.

STATUS OF CLAIMS

The claims presently pending are Claims 33-51, and are found as presently amended in the Appendix. Claims 1-32 have been canceled.

STATUS OF AMENDMENTS

No amendment has been submitted after Final Rejection, only a request for reconsideration (Response to Final Rejection filed November 26, 2003).

SUMMARY OF INVENTION

The invention as claimed in independent Claim 33 relates to a process for producing polysaccharide ethers which comprises the following steps:

(i) Polysaccharide is treated with a basic compound to promote swelling of the polysaccharide.

(ii) The polysaccharide is treated with at least one derivatizing agent in a liquid medium which comprises at least one organic solvent. The treatment is carried out under conditions which are effective to promote a reaction between the polysaccharide and the derivatizing agent and form a reaction product which comprises a polysaccharide ether, the basic compound, the organic solvent and a residue of the polysaccharide.

(iii) At least a portion of the reaction product of step (ii), which comprises the basic compound, is treated with an acidic compound to provide a neutralized liquid. The neutralized liquid comprises a salt of the acidic compound and the basic compound.

(iv) The polysaccharide ether is separated from at least one of the reaction product or the neutralized liquid.

The invention as claimed in independent Claim 33 with the above identified steps (i) – (iv) comprises the following two improvements:

(a) The neutralized liquid is subjected to a first separation at an alkaline pH to separate the salt from the organic solvent and the residue of the polysaccharide and provide a purified, neutralized liquid; and

(b) the purified, neutralized liquid is subjected to an electric current and a separation means. The separation means is effective to promote the conversion of the salt to the acidic compound and the basic compound.

These broad aspects of the Invention are described on page 6, lines 1-18; page 7, lines 3-9; page 7, lines 1-2 from the bottom; page 8, lines 1-4 and page 9, lines 15-25 of the Specification.

In the dependent claims preferred product streams, preferred separation means, preferred pH values and current densities during the separation step (a), preferred organic solvents, preferred basic and acidic compounds, preferred polysaccharides and preferred derivatizing agents are stated.

Dependent Claim 34 relates to the production of an acid product stream which comprises the acidic compound. This aspect of the Invention is described on page 15, lines 12 and 13.

Dependent Claim 35 relates to the production of a base product stream which comprises the basic compound. This aspect of the Invention is described on page 15, lines 17 and 18.

Dependent Claims 36 and 37 relate to the utilization of at least a portion of the acid product stream in step (iii) and of at least a portion of the base product stream in step (i) of claim 33.

Dependent Claim 38 relates to the presence of a bipolar membrane effective to provide a source of hydrogen and hydroxyl ions in the improvement (b) wherein the

purified, neutralized liquid is subjected to an electric current. This aspect of the Invention is described on page 8, lines 16 - 18 of the Specification.

Dependent Claim 39 relates to a preferred aspect of the Invention wherein the first separation (a) is conducted by electrodialysis with a semi-permeable membrane. This aspect of the Invention is described on page 9, lines 1-6 from the bottom of the Specification.

Dependent Claim 40 relates to a preferred aspect of the first separation (a) as claimed in claim 39 wherein the pH is effective to inhibit the deposition of the residual of the polysaccharide on the membrane. This aspect of the Invention is described on page 10, second paragraph of the Specification.

Dependent Claims 41 and 42 relate to preferred pH ranges described on page 10, second paragraph of the Specification.

Dependent Claim 43 relates to the use of a preferred current density which is described on page 9, line 9 of the Specification.

Dependent Claim 44 relates to preferred organic solvents described on page 7, lines 6 – 9 of the Specification.

Dependent Claim 45 relates to preferred basic compounds described on page 6, lines 4 – 7 from the bottom of the Specification.

Dependent Claim 46 relates to preferred acidic compounds described on page 7, lines 1 and 2 of the Specification.

Dependent Claim 47 relates to preferred polysaccharides described on page 3, the third paragraph of the Specification.

Dependent Claims 48 and 49 relate to preferred derivatizing agents described on page 4, lines 8 - 9 and 17 – 18 of the Specification.

In another aspect, the invention as claimed in independent Claim 50 relates to the same steps (i) – (iv) identified in independent Claim 33 except that independent Claim 50 relates to the production of cellulose ethers from cellulose. Cellulose ethers are preferred polysaccharides and cellulose is a preferred polysaccharide. This aspect of the Invention is described on page 3, lines 16 – 18 of the Specification.

The invention as claimed in independent Claim 50 with the above identified steps (i) – (iv) comprises the following two improvements:

(a) The neutralized liquid is subjected to a first separation by electrodialysis with a semi-permeable membrane at an alkaline pH to separate the salt from the organic solvent and the residue of the cellulose and provide a purified, neutralized liquid; and

(b) The purified, neutralized liquid is subjected to an electric current and a separation means effective to promote the conversion of the salt to the acidic compound and the basic compound.

Aspects of step (a) of Claim 50, which are not reflected in the discussion of Claim 33, are described 9, lines 1-3 from the bottom of page 9 and page 10, lines 2 – 5 of the Specification. All aspects of step (b) of Claim 51 are reflected in the discussion of Claim 33.

Dependent Claim 51 relates to a preferred aspect of the first separation (a) as claimed in claim 50 wherein the pH is effective to inhibit the deposition of the cellulose on the membrane. This aspect of the Invention is described on page 10, second paragraph of the Specification.

ISSUES

The only issue for decision on appeal is:

Whether the Examiner's Final Rejection of all the claims under U.S.C. § 103(a), as unpatentable over the combination of references hereafter discussed, is sustainable or should be reversed. Appellants submit that it must be reversed.

GROUPING OF CLAIMS

The Appellants contest each ground of the Final Rejection.

The Appellants submit that Claims 39 – 43, 50 and 51 are separately patentable in that they claim that the first separation (a) wherein the salt is separated from the organic solvent and the residue of the polysaccharide / cellulose is carried out by electrolysis with a semi-permeable membrane.

The Appellants also submit that Claims 40 – 42 and 51 are separately patentable in that they claim that the first separation (a) is carried out by electrolysis with a semi-permeable membrane and a pH is selected which is effective to inhibit the deposition of the residual of the polysaccharide / cellulose on the membrane.

ARGUMENT

The References Relied upon by the Examiner

Reference 1) : Warzecha et al. (DE 1668347)

This reference relates to the production of hydroxyethyl cellulose by reacting alkali cellulose with ethylene oxide. A crude product is obtained which contains an alkali hydroxide. In the introduction on page 1 of this reference known procedures for the removal of alkali hydroxide from the hydroxyethyl cellulose are discussed. According to the known procedures the alkali hydroxide is transformed into a salt by adding an organic acid. For example, the alkali hydroxide is transformed into the alkali acetate by adding acetic acid. The salt is then removed with the aid of a mixture of organic solvents.

On page 2 Warzecha et al. discuss in detail the disadvantages of the known procedures, such as the disposition of the salt. To overcome these alleged disadvantages, Warzecha et al teach on page 3, paragraph 3 a process wherein crude hydroxyalkyl cellulose, which contains an alkali hydroxide is scrubbed with a washing fluid which consists of 50-70 vol.% methanol and 50-30 vol.% acetone or isopropanol. Sodium hydroxide is removed to a

large extent from crude product (page 4, paragraph 3). The washing fluid is neutralized with acid.

Reference 2): Takahashi et al. (JP 1-149801)

This reference relates to the production of a cellulose ether free from sodium salt. The process starts from a cellulose ether sodium salt, such as the sodium salt of carboxy methyl cellulose or sulfoethyl cellulose. The sodium salt is converted into an acid-type cellulose by electrodialysis. The acid-type cellulose is reacted with a base or a salt, such as a hydroxide, chloride or a C_{1-3} carboxylic acid salt of lithium, calcium, magnesium or aluminum.

Rejection:

Claims 33-51 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Warzecha et al. in view of Takahashi et al. for reasons stated in the first Office Action.

The Examiner's reasons for rejecting all claims on file in the first Office Action are summarized hereafter:

> "...Warzecha et al. teach a process for purifying crude hydroxyethylcellulose (page 3, 3rd paragraph). On page 1, 2nd paragraph and page 3, 3rd paragraph, cellulose is treated with sodium hydroxide and then reacted with derivatizing agent ethylene oxide in a mixture of organic solvents containing methanol and acetone to form a reaction product comprising hydroxyethyl cellulose (polysaccharide ether), the reaction mixture is further treated with nitric acid to provide a neutralized liquid comprising a salt of the acidic compound and the basic compound. "

The Examiner went on to say

> "While the Warzecha et al. process is closely analogous to the applicants process, Warzecha et al differ from aplicant's process in that the separation of the polysaccharide ether is achieved by subjecting the neutralized reaction mixture to distillation instead of electrodialysis."

The Examiner then discussed briefly the teaching of Takahashi et al.:

" ... Takahashi et al. teach the use of electrical energy to eliminate sodium for a cellulose ether salt. Takahashi et al. teach a method of subjecting a cellulose ether sodium salt to electrodialysis to convert it to the acid form, followed by reaction with a base or salt. On page 5, Working Example 1, a carboxymethylcellulose sodium salt in the absence of any organic solvent is electrodialysed comprising electrodes and ultrafiltration membranes as the dialysis membranes and at a current of 0.55 A"

The Examiner acknowledged:

" .... It is noted that Takahashi et al. does not provide specific disclosures regarding the use of current densities and variable pH's in the prior art electrolysis process. "

After the summary of Takahashi's teaching the Examiner said:

" Therefore, one of ordinary skill in the art would have found the applicants claimed process for producing polysaccharide ethers to have been obvious at the time the invention was made having the above references before him. Since Warzecha et al teach a process for producing a neutralized reaction mixture comprising a salt of the acidic compound and the basic compound of hydroxyethyl cellulose and Takahashi et al. teach a method of subjecting a cellulose ether sodium salt to electrolysis to convert it to the acid form, one skilled in the art would have a reasonable expectation for success in combining both references to accomplish the conversion of a polysaccharide ether salt to the acidic compound and the basis compound. The motivation for doing so is provided by Takahashi et al. which suggests the eletrodialysis step in the preparation of cellulose ether provides high yields and low pollution (page 4, 7th paragraph)."

In the Response A, dated April 2, 2003 to the First Office Action Appellants addressed the Examiner's statement that

"... one skilled in the art would have a reasonable expectation for success in combining both references to accomplish the conversion of a polysaccharide ether salt to the acidic compound and the basis compound."

The Appellants' argument that

1. the conversion of a polysaccharide ether salt is not what is claimed in claims 33 and 50, but that the present invention relates to the treatment of a neutralized liquid after separation of the polysaccaride ether in step (iv) of claims 33 and 50

was not commented by the Examiner in the Final Rejection.

The Appellants' further arguments, mainly that

2. the teachings of Warzecha et al. and Takahashi et al. cannot be combined because Warzecha et al. specifically teach a process for purifying crude hydroxyethyl cellulose, which is a non-ionic material, whereas Takahashi et al. teach the conversion of a cellulose ether sodium salt, such as a sodium salt of carboxymethyl cellulose or sulfoethyl cellulose, and

3. Even if the teachings of Warzecha et al. and of Takahashi et al. could be combined, theperson of ordinary skill in the art would not arrive at the process of the present invention

were not accepted by the Examiner.

Argument for Patentability

The following aspects of Claim 33 of the patent application under Appeal are important to fully understand the present invention:

A polysaccharide is produced according to steps (i) and (ii) indicated above. The reaction product comprises:

- a polysaccharide ether
- a basic compound

- an organic solvent and

- a residue of the polysaccharide.

Theperson of ordinary skill in the art knows that the listed compounds form a mixture, but that they are separate chemical compounds. Due to the presence of an organic solvent, at least some of the mixture is in liquid state.

In step (iii) an acidic compound is added to the mixture indicated above. It is clear to theperson of ordinary skill in the art that the acidic compound reacts with the basic compound, but not with the polysaccharide ether, which is separate from the basic compound. Also from the wording of claim 33 it is clear that a salt of the acidic compound and the basic compound is produced. The product of step (iii) is designated in Claim 33 as "neutralized liquid".

In step (iv) the polysaccharide ether is separated from at least one of the reaction product or the neutralized liquid. This means that the polysaccharide ether can be separated before and/or after the neutralization step (iii) from the other components of the mixture. Specific ways of separating the polysaccharide ether from the other components of the mixture or potential further treatments of the polysaccharide ether are not aspects of the present invention.

The following separation steps (a) and (b) relate to the treatment of the neutralized liquid that is left after the separation of the polysaccharide, but not to the separation or treatment of the polysaccharide.

According to step (a) the salt is separated from organic solvent and residue of the polysaccharide at an alkaline pH to provide a purified, neutralized liquid. Step (b) and preferred embodiments of step (b) are described on page 9, lines 15 – 27 of the specification. Various means for separating the salt from organic solvent and residue of the polysaccharide are described, such as distillation, membrane separation, filtration, ulta-filtration, eletrolysis or electrodialysis.

In step (b) the purified, neutralized liquid is subjected to an electric current and a separation means. The conversion of the salt to the acidic compound and the basis compound is promoted in step (b).

Accordingly, the main object of the present invention is the treatment of the neutralized liquid that is left after separation of the polysaccharide. The neutralized liquid is treated according to steps (a) and (b) described above in order to solve the problem of salt disposition which may not be environmentally desirable or feasible (page 1, last four lines and page 2, lines 1-4 of the Specification).

In the reasoning for the Final Rejection the Examiner stated: "...While the Warzecha et al. process is closely analogous to the applicants process, Warzecha et al differ from aplicant's process in that the separation of the polysaccharide ether is achieved by subjecting the neutralized reaction mixture to distillation instead of electrodialysis." (emphasis added)

Appellants agree with the Examiner that the Warzecha et al. process is closely analogous to steps (i) – (iv) of the process claimed in the patent application under Appeal.

However, Appellants respectfully submit that in the process of Warzecha et al. no separation of the polysaccharide ether (hydroxyethyl cellulose) is achieved by subjecting the neutralized reaction mixture to distillation. Warzecha et al. teach distillation of the neutralized reaction mixture after its separation from the hydroxyethylcellulose.

Also, as the Appellants have previously explained, the separation steps (a) and (b) of the process claimed in the patent application under Appeal relate to the treatment of the neutralized liquid that is left after the separation of the polysaccharide, but not to the separation or treatment of the polysaccharide.

In the reasoning for the Final Rejection the Examiner stated " ... Since Warzecha et al teach a process for producing a neutralized reaction mixture comprising a salt of the acidic compound and the basic compound of hydroxyethyl cellulose and Takahashi et al. teach a method of subjecting a cellulose ether sodium salt to electrolysis to convert it to the acid form, one skilled in the art would have a reasonable expectation for success in combining both references to accomplish the conversion of a polysaccharide ether salt to the acidic compound and the basis compound. ..." (emphasis added)

Appellants respectfully submit that this statement by the Examiner is incorrect in two points:

1. The neutralized reaction mixture that is subjected to distillation according to Warzecha's teaching does not contain a "salt of the acidic compound and the basic compound of hydroxyethyl cellulose". Distillation of the neutralized reacation mixture takes place after separation of hydroxyethyl cellulose from the neutralized reaction mixture. Moreover, the salt of the acidic compound and the basic compound is a simple salt, such as sodium acetate (page 5, line 2 of Warzecha s teaching) which has nothing to do with the hydroxyethyl cellulose.
2. The subject of the present invention is not to accomplish the conversion of a polysaccharide ether salt to the acidic compound and the basis compound. As explained above, steps (a) and (b) do not treat a polysaccharide ether but a liquid from which a polysaccharide ether previously had been separated.

Therefore, Appellants respectfully submit that the Examiner has based his Final Rejection on a wrong technical assumption. For this reason the Final Rejection is not sustainable and should be reversed.

Furthermore, Appellants submit that there is no motivation for theperson of ordinary skill in the art to combine the teachings of Warzecha et al. and of Takahashi et al. Warzecha et al addresses the problem of large amounts of salts, such as sodium acetate, left in the fluid used for scrubbing hydroxyethyl cellulose. Warzecha suggests to solve this problem by neutralizing the scrubbing fluid only after the separation of the hydroxyethyl cellulose. Warzecha et al. list on page 4, lines 9 and 10 the advantages of their process, e.g., that their process leaves the hydroxyethyl cellulose unchanged.

As explained further above, the main object of the present invention is the treatment of the neutralized liquid that is left after separation of the polysaccharide. Someone of ordinary skill in the art who is working on solving this poblem would not consider the teaching of Takahashi at all. Takahashi et al. do not even address the

problem that may be caused by a liquid that is left after the separation of the polysaccharide.

The Examiner indicated that the motivation for combining both references " ... is provided by Takahashi et al. which suggest the eletrodialysis step in the preparation of cellulose ether provides high yields and low pollution (page 4, 7th paragraph)." Indeed the teaching of Takahashi et al. relates to the conversion of a cellulose ether sodium salt into a corresponding cellulose ether salt with another cation, such as lithium, calcium, magnesium or aluminium.

However, Takahashi et al. do mention a salt-containing liquid that is left after the separation of the polysaccharide at all and even less provide a solution to the problem of disposing such liquids.

Applicants urge that it is improper to use the claimed invention as a template to piece together teachings of prior art so that the claimed invention is rendered obvious (In re Fritch 972 F.2d 1260, 1265, 23, U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992)). Since the Examiner's argumentation for the combinability of the two references relied on two incorrect technical assumptions, the Examiner has failed to show that someone of ordinary skill in the art would be motivated to combine the teachings of Warzecha et al. and Takahashi et al. Moreover, the references themselves contain no teaching to indicate the suitability of combining their teachings and there is no statement in the present record amounting to a clear and particular showing of the combinability of the two references (Winner Int'l Royalty Corp. v. Wang, 202 F.3d 1340 (Fed. Cir., 2000), *reh'g en banc denied,* (Fed. Cir., 2000); *cert. denied,* 120 S. Ct. 2679 (US 2000)).

Even if, for the sake of argumention, one would agree with the Examiner that one skilled in the art would have a reasonable expectation for success in combining both references to accomplish the conversion of a polysaccharide ether salt to the acidic compound and the basis compound, this expectation would not lead theperson of ordinary skill in the art to the process as claimed in the patent application under Appeal. As indicated above, the subject of the present invention is not to accomplish

the conversion of a polysaccharide ether salt to the acidic compound and the basis compound.

If, for the sake of argumention, someone of ordinary skill in the art would combine the teachings of Warzecha et al. and of Takahashi et al., the following process would result: Crude water-soluble hydroxyethyl cellulose containing alkali hydroxide is washed with a mixture of 50-70 vol.% methanol and 50-30 vol.% acetone or isopropanol. The washing fluid is neutralized with an acid and the neutralized washing fluid is subjected to distillation (process as taught by Warzecha). The hydroxyethyl cellulose is subjected to an electrodialysis as taught by Takahashi.

However, this is not the process claimed in any of the claims of the patent application under Appeal.

Moreover, Warzecha et al. and Takahashi et al. do not teach, neither taken separately nor in combination, subjecting the neutralized liquid - that is left after the separation of the polysaccharide - to two separation steps (a) and (b) of which the first separation step is conducted at an alkaline pH. On page 2, lines 16 – 20 of the specification filed by the Appellants the importance of the separation step (a) is explained. In this step organic solvents and residues of the polysaccharide are removed from the salt-containing stream in order to avoid fouling of the separation means, such as bipolar membranes, in the subsequent separation step (b).

For the reasons stated above the invention as claimed in independent Claims 33 and 50 and all claims dependent thereon is unobvious over Warzecha et al. in view of Takahashi et al.

Furthermore, Claims 39 – 43, 50 and 51 are separately patentable as unobvious over Warzecha et al. in view of Takahashi et al. Claims 39 – 43, 50 and 51 claim that the first separation (a) wherein the salt is separated from the organic solvent and the residue of the polysaccharide / cellulose is carried out by electrodialysis with a semipermeable membrane at an alkaline pH. Quite surprisingly, in accordance with the present invention, it has been found that by conducting the electrodialysis at an alkaline pH, the degree of fouling of the membrane can be

reduced and the ionic mobility of the salt through the membrane can be enhanced (page 2, last two lines, page 2, lines 1 and 2 and page 10, second paragraph of the specification).

Warzecha et al. and only teaches neutralization of the washing fluid with an acid and subjecting the neutralized washing fluid to distillation.

Neither Warzecha et al. nor Takahashi et al., taken separately or in combination, teach or suggest anywhere a process wherein:

after separation of the polysaccharide ether

(a) the neutralized liquid is subjected to a first separation by electrodialysis with a semi-permeable membrane at an alkaline pH to separate the salt from the organic solvent and the residue of the polysaccharide and provide a purified, neutralized liquid; and

(b) the purified, neutralized liquid is subjected to an electric current and a separation means effective to promote the conversion of the salt to the acidic compound and the basic compound.

Furthermore, Claims 40 – 42 and 51 are separately patentable as unobvious over Warzecha et al. in view of Takahashi et al. According to Claims 40 – 42 and 51 a pH is selected in the first separation (a) which is effective to inhibit the deposition of the residual of the polysaccharide or cellulose on the membrane.

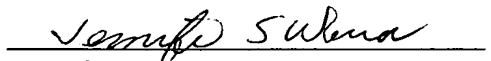
The comparison between Control Example 2 and Example 3 on pages 18 and 19 of the specification illustrates that deposition of the residual of the polysaccharide or cellulose on the membrane can be reduced and the ionic mobility of the salt through the membrane can be enhanced by selecting an alkaline pH.

As acknowledged by the Examiner, Takahashi et al. do not provide specific disclosures regarding the use variable pH's in the electrolysis process. Takahashi et al do not teach or suggest anywhere that deposition of the residual of the polysaccharide or cellulose on the membrane can be inhibited by selecting a certain pH.

CONCLUSION

Based on the above discussion Appellants respectfully submit that the invention as claimed in independent Claims 33 and 50 and all claims dependent thereon is unobvious over Warzecha et al. in view of Takahashi et al. Accordingly, Appellants urge this Honorable Board of Patent Appeals and Interferences to reverse the Final Rejection of the Examiner in respect to all claims in this application.

Respectfully submitted,



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APPENDIX

The Claims on Appeal

33. In a process for producing polysaccharide ethers comprising:

(i) treating polysaccharide with a basic compound to promote swelling of the polysaccharide;

(ii) reacting the polysaccharide with at least one derivatizing agent in a liquid medium comprising at least one organic solvent under conditions effective to promote a reaction between the polysaccharide and the derivatizing agent and form a reaction product comprising a polysaccharide ether, the basic compound and the organic solvent and a residue of the polysaccharide;

(iii) treating at least a portion of the reaction product comprising the basic compound with an acidic compound to provide a neutralized liquid comprising a salt of the acidic compound and the basic compound; and

(iv) separating the polysaccharide ether from at least one of the reaction product or the neutralized liquid:

The improvement which comprises:

(a) subjecting the neutralized liquid to a first separation at an alkaline pH to separate the salt from the organic solvent and the residue of the polysaccharide and provide a purified, neutralized liquid; and

(b) subjecting the purified, neutralized liquid to an electric current and a separation means effective to promote the conversion of the salt to the acidic compound and the basic compound.

34. The process of claim 33 which provides an acid product stream comprising the acidic compound.

35. The process of claim 33 which provides a base product stream comprising the basic compound.

36. The process of claim 33 further comprising utilizing at least a portion of the acid product stream in step (iii) of claim 1.

37. The process claim 33 further comprising utilizing at least a portion of the base product stream in step (i) of claim 1.

38. The process of claim 33 wherein said subjecting of the purified, neutralized liquid with the electric current is conducted in the presence of a bipolar membrane effective to provide a source of hydrogen and hydroxyl ions.

39. The process of claim 33 wherein the first separation is conducted by electrodialysis with a semi-permeable membrane.

40. The process of claim 39 wherein the pH is effective to inhibit the deposition of the residual of the polysaccharide on the membrane.

41. The process of claim 40 wherein the pH is greater than about 10.

42. The process of claim 41 wherein the pH is from 10.5 to 14.

43. The process of claim 41 wherein the electric current has a current density of from 500 to 2000 amps per square meter.

44. The process of claim 33 wherein the organic solvent is selected from the group consisting of acetone, ethanol, isopropyl alcohol, t-butyl alcohol, mono-, di, and triethylene glycol and mixtures thereof.

45. The process of claim 33 wherein the basic compound is selected from the group consisting of sodium hydroxide, potassium hydroxide, calcium hydroxide, magnesium hydroxide, lithium hydroxide, ammonium hydroxide and mixtures thereof.

46. The process of claim 33 wherein the acidic compound is selected from the group consisting of acetic acid, nitric acid, hydrochloric acid, sulfuric acid, phosphoric acid and mixtures thereof.

47. The process of claim 33 wherein the polysaccharide is selected from the group consisting of cellulose, starch, pectin, chitosan, chitin, agar, carrageenan, alginate, guar, arabic, tragacanth, xanthan gum and mixtures thereof.

48. The process of claim 33 wherein the derivatizing agent is an alkylene oxide and selected from the group consisting of ethylene oxide, propylene oxide, butylene oxide and mixtures thereof.

49. The process of claim 33 which further comprises derivatizing the polysaccharide ether with at least one cationic, anionic or hydrophobic substituent.

50. A process for producing cellulose ethers comprising:

(i) treating cellulose with a basic compound to promote swelling of the cellulose;

(ii) reacting the cellulose with at least one derivatizing agent in a liquid medium comprising at least one organic solvent under conditions effective to promote a reaction between the cellulose and the derivatizing agent and form a reaction product comprising a cellulose ether, the basic compound and the organic solvent and a residue of the cellulose;

(iii) treating at least a portion of the reaction product comprising the basic compound with an acidic compound to provide a neutralized liquid comprising a salt of the acidic compound and the basic compound; and

(iv) separating the cellulose ether from at least one of the reaction product or neutralized liquid:

The improvement which comprises:

(a) subjecting the neutralized liquid to a first separation by electrodialysis with a semi-permeable membrane at an alkaline pH to separate the salt from the organic solvent and the residue of the cellulose and provide a purified, neutralized liquid; and

(b) subjecting the purified, neutralized liquid to an electric current and a separation means effective to promote the conversion of the salt to the acidic compound and the basic compound.

51. The process of claim 50 wherein the pH is effective to inhibit the deposition of the residue of the cellulose on the membrane.

Footnote: It is noted that typographical errors have crept into line 2 of Claim 36 and line 2 of Claim 37. In each of Claims 36 and 37 the term " of claim 1 " should be replaced by -- of claim 33 --. However, these typographical errors are readily discerned so the claims have been reproduced as they presently stand.

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Docket No.	:	UC 17795-2	
Customer No.	:	00109	

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Sir:

BRIEF FOR APPELLANT

This is an appeal to the Board of Appeals from the decision dated September 15, 2003 of the Primary Examiner rejecting Claims 33-51, all pending claims in the above identified application.

REAL PARTY IN INTEREST

The Real Party in Interest in this Appeal is Union Carbide Corporation.

RELATED APPEALS AND INTERFERENCES

At this time there are no related appeals or interferences.

STATUS OF CLAIMS

The claims presently pending are Claims 33-51, and are found as presently amended in the Appendix. Claims 1-32 have been canceled.

STATUS OF AMENDMENTS

No amendment has been submitted after Final Rejection, only a request for reconsideration (Response to Final Rejection filed November 26, 2003).

SUMMARY OF INVENTION

The invention as claimed in independent Claim 33 relates to a process for producing polysaccharide ethers which comprises the following steps:

(i) Polysaccharide is treated with a basic compound to promote swelling of the polysaccharide.

(ii) The polysaccharide is treated with at least one derivatizing agent in a liquid medium which comprises at least one organic solvent. The treatment is carried out under conditions which are effective to promote a reaction between the polysaccharide and the derivatizing agent and form a reaction product which comprises a polysaccharide ether, the basic compound, the organic solvent and a residue of the polysaccharide.

(iii) At least a portion of the reaction product of step (ii), which comprises the basic compound, is treated with an acidic compound to provide a neutralized liquid. The neutralized liquid comprises a salt of the acidic compound and the basic compound.

(iv) The polysaccharide ether is separated from at least one of the reaction product or the neutralized liquid.

The invention as claimed in independent Claim 33 with the above identified steps (i) – (iv) comprises the following two improvements:

(a) The neutralized liquid is subjected to a first separation at an alkaline pH to separate the salt from the organic solvent and the residue of the polysaccharide and provide a purified, neutralized liquid; and

(b) the purified, neutralized liquid is subjected to an electric current and a separation means. The separation means is effective to promote the conversion of the salt to the acidic compound and the basic compound.

These broad aspects of the Invention are described on page 6, lines 1-18; page 7, lines 3-9; page 7, lines 1-2 from the bottom; page 8, lines 1-4 and page 9, lines 15-25 of the Specification.

In the dependent claims preferred product streams, preferred separation means, preferred pH values and current densities during the separation step (a), preferred organic solvents, preferred basic and acidic compounds, preferred polysaccharides and preferred derivatizing agents are stated.

Dependent Claim 34 relates to the production of an acid product stream which comprises the acidic compound. This aspect of the Invention is described on page 15, lines 12 and 13.

Dependent Claim 35 relates to the production of a base product stream which comprises the basic compound. This aspect of the Invention is described on page 15, lines 17 and 18.

Dependent Claims 36 and 37 relate to the utilization of at least a portion of the acid product stream in step (iii) and of at least a portion of the base product stream in step (i) of claim 33.

Dependent Claim 38 relates to the presence of a bipolar membrane effective to provide a source of hydrogen and hydroxyl ions in the improvement (b) wherein the

purified, neutralized liquid is subjected to an electric current. This aspect of the Invention is described on page 8, lines 16 - 18 of the Specification.

Dependent Claim 39 relates to a preferred aspect of the Invention wherein the first separation (a) is conducted by electrodialysis with a semi-permeable membrane. This aspect of the Invention is described on page 9, lines 1-6 from the bottom of the Specification.

Dependent Claim 40 relates to a preferred aspect of the first separation (a) as claimed in claim 39 wherein the pH is effective to inhibit the deposition of the residual of the polysaccharide on the membrane. This aspect of the Invention is described on page 10, second paragraph of the Specification.

Dependent Claims 41 and 42 relate to preferred pH ranges described on page 10, second paragraph of the Specification.

Dependent Claim 43 relates to the use of a preferred current density which is described on page 9, line 9 of the Specification.

Dependent Claim 44 relates to preferred organic solvents described on page 7, lines 6 – 9 of the Specification.

Dependent Claim 45 relates to preferred basic compounds described on page 6, lines 4 – 7 from the bottom of the Specification.

Dependent Claim 46 relates to preferred acidic compounds described on page 7, lines 1 and 2 of the Specification.

Dependent Claim 47 relates to preferred polysaccharides described on page 3, the third paragraph of the Specification.

Dependent Claims 48 and 49 relate to preferred derivatizing agents described on page 4, lines 8 - 9 and 17 – 18 of the Specification.

In another aspect, the invention as claimed in independent Claim 50 relates to the same steps (i) – (iv) identified in independent Claim 33 except that independent Claim 50 relates to the production of cellulose ethers from cellulose. Cellulose ethers are preferred polysaccharides and cellulose is a preferred polysaccharide. This aspect of the Invention is described on page 3, lines 16 – 18 of the Specification.

The invention as claimed in independent Claim 50 with the above identified steps (i) – (iv) comprises the following two improvements:

(a) The neutralized liquid is subjected to a first separation by electrodialysis with a semi-permeable membrane at an alkaline pH to separate the salt from the organic solvent and the residue of the cellulose and provide a purified, neutralized liquid; and

(b) The purified, neutralized liquid is subjected to an electric current and a separation means effective to promote the conversion of the salt to the acidic compound and the basic compound.

Aspects of step (a) of Claim 50, which are not reflected in the discussion of Claim 33, are described 9, lines 1-3 from the bottom of page 9 and page 10, lines 2 – 5 of the Specification. All aspects of step (b) of Claim 51 are reflected in the discussion of Claim 33.

Dependent Claim 51 relates to a preferred aspect of the first separation (a) as claimed in claim 50 wherein the pH is effective to inhibit the deposition of the cellulose on the membrane. This aspect of the Invention is described on page 10, second paragraph of the Specification.

ISSUES

The only issue for decision on appeal is:

Whether the Examiner's Final Rejection of all the claims under U.S.C. § 103(a), as unpatentable over the combination of references hereafter discussed, is sustainable or should be reversed. Appellants submit that it must be reversed.

GROUPING OF CLAIMS

The Appellants contest each ground of the Final Rejection.

The Appellants submit that Claims 39 – 43, 50 and 51 are separately patentable in that they claim that the first separation (a) wherein the salt is separated from the organic solvent and the residue of the polysaccharide / cellulose is carried out by electrolysis with a semi-permeable membrane.

The Appellants also submit that Claims 40 – 42 and 51 are separately patentable in that they claim that the first separation (a) is carried out by electrolysis with a semi-permeable membrane and a pH is selected which is effective to inhibit the deposition of the residual of the polysaccharide / cellulose on the membrane.

ARGUMENT

The References Relied upon by the Examiner

Reference 1) : Warzecha et al. (DE 1668347)

This reference relates to the production of hydroxyethyl cellulose by reacting alkali cellulose with ethylene oxide. A crude product is obtained which contains an alkali hydroxide. In the introduction on page 1 of this reference known procedures for the removal of alkali hydroxide from the hydroxyethyl cellulose are discussed. According to the known procedures the alkali hydroxide is transformed into a salt by adding an organic acid. For example, the alkali hydroxide is transformed into the alkali acetate by adding acetic acid. The salt is then removed with the aid of a mixture of organic solvents.

On page 2 Warzecha et al. discuss in detail the disadvantages of the known procedures, such as the disposition of the salt. To overcome these alleged disadvantages, Warzecha et al teach on page 3, paragraph 3 a process wherein crude hydroxyalkyl cellulose, which contains an alkali hydroxide is scrubbed with a washing fluid which consists of 50-70 vol.% methanol and 50-30 vol.% acetone or isopropanol. Sodium hydroxide is removed to a

large extent from crude product (page 4, paragraph 3). The washing fluid is neutralized with acid.

Reference 2): Takahashi et al. (JP 1-149801)

This reference relates to the production of a cellulose ether free from sodium salt. The process starts from a cellulose ether sodium salt, such as the sodium salt of carboxy methyl cellulose or sulfoethyl cellulose. The sodium salt is converted into an acid-type cellulose by electrodialysis. The acid-type cellulose is reacted with a base or a salt, such as a hydroxide, chloride or a C_{1-3} carboxylic acid salt of lithium, calcium, magnesium or aluminum.

Rejection:

Claims 33-51 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Warzecha et al. in view of Takahashi et al. for reasons stated in the first Office Action.

The Examiner's reasons for rejecting all claims on file in the first Office Action are summarized hereafter:

> "...Warzecha et al. teach a process for purifying crude hydroxyethylcellulose (page 3, 3rd paragraph). On page 1, 2nd paragraph and page 3, 3rd paragraph, cellulose is treated with sodium hydroxide and then reacted with derivatizing agent ethylene oxide in a mixture of organic solvents containing methanol and acetone to form a reaction product comprising hydroxyethyl cellulose (polysaccharide ether), the reaction mixture is further treated with nitric acid to provide a neutralized liquid comprising a salt of the acidic compound and the basic compound. "

The Examiner went on to say

> "While the Warzecha et al. process is closely analogous to the applicants process, Warzecha et al differ from aplicant's process in that the separation of the polysaccharide ether is achieved by subjecting the neutralized reaction mixture to distillation instead of electrodialysis."

The Examiner then discussed briefly the teaching of Takahashi et al.:

" ... Takahashi et al. teach the use of electrical energy to eliminate sodium for a cellulose ether salt. Takahashi et al. teach a method of subjecting a cellulose ether sodium salt to electrodialysis to convert it to the acid form, followed by reaction with a base or salt. On page 5, Working Example 1, a carboxymethylcellulose sodium salt in the absence of any organic solvent is electrodialysed comprising electrodes and ultrafiltration membranes as the dialysis membranes and at a current of 0.55 A"

The Examiner acknowledged:

" .... It is noted that Takahashi et al. does not provide specific disclosures regarding the use of current densities and variable pH's in the prior art electrolysis process. "

After the summary of Takahashi's teaching the Examiner said:

" Therefore, one of ordinary skill in the art would have found the applicants claimed process for producing polysaccharide ethers to have been obvious at the time the invention was made having the above references before him. Since Warzecha et al teach a process for producing a neutralized reaction mixture comprising a salt of the acidic compound and the basic compound of hydroxyethyl cellulose and Takahashi et al. teach a method of subjecting a cellulose ether sodium salt to electrolysis to convert it to the acid form, one skilled in the art would have a reasonable expectation for success in combining both references to accomplish the conversion of a polysaccharide ether salt to the acidic compound and the basis compound. The motivation for doing so is provided by Takahashi et al. which suggests the eletrodialysis step in the preparation of cellulose ether provides high yields and low pollution (page 4, 7th paragraph)."

In the Response A, dated April 2, 2003 to the First Office Action Appellants addressed the Examiner's statement that

"... one skilled in the art would have a reasonable expectation for success in combining both references to accomplish the conversion of a polysaccharide ether salt to the acidic compound and the basis compound."

The Appellants' argument that

1. the conversion of a polysaccharide ether salt is not what is claimed in claims 33 and 50, but that the present invention relates to the treatment of a neutralized liquid after separation of the polysaccaride ether in step (iv) of claims 33 and 50

was not commented by the Examiner in the Final Rejection.

The Appellants' further arguments, mainly that

2. the teachings of Warzecha et al. and Takahashi et al. cannot be combined because Warzecha et al. specifically teach a process for purifying crude hydroxyethyl cellulose, which is a non-ionic material, whereas Takahashi et al. teach the conversion of a cellulose ether sodium salt, such as a sodium salt of carboxymethyl cellulose or sulfoethyl cellulose, and

3. Even if the teachings of Warzecha et al. and of Takahashi et al. could be combined, theperson of ordinary skill in the art would not arrive at the process of the present invention

were not accepted by the Examiner.

Argument for Patentability

The following aspects of Claim 33 of the patent application under Appeal are important to fully understand the present invention:

A polysaccharide is produced according to steps (i) and (ii) indicated above. The reaction product comprises:
- a polysaccharide ether
- a basic compound

- an organic solvent and

- a residue of the polysaccharide.

Theperson of ordinary skill in the art knows that the listed compounds form a mixture, but that they are separate chemical compounds. Due to the presence of an organic solvent, at least some of the mixture is in liquid state.

In step (iii) an acidic compound is added to the mixture indicated above. It is clear to theperson of ordinary skill in the art that the acidic compound reacts with the basic compound, but not with the polysaccharide ether, which is separate from the basic compound. Also from the wording of claim 33 it is clear that a salt of the acidic compound and the basic compound is produced. The product of step (iii) is designated in Claim 33 as "neutralized liquid".

In step (iv) the polysaccharide ether is separated from at least one of the reaction product or the neutralized liquid. This means that the polysaccharide ether can be separated before and/or after the neutralization step (iii) from the other components of the mixture. Specific ways of separating the polysaccharide ether from the other components of the mixture or potential further treatments of the polysaccharide ether are not aspects of the present invention.

The following separation steps (a) and (b) relate to the treatment of the neutralized liquid that is left after the separation of the polysaccharide, but not to the separation or treatment of the polysaccharide.

According to step (a) the salt is separated from organic solvent and residue of the polysaccharide at an alkaline pH to provide a purified, neutralized liquid. Step (b) and preferred embodiments of step (b) are described on page 9, lines 15 – 27 of the specification. Various means for separating the salt from organic solvent and residue of the polysaccharide are described, such as distillation, membrane separation, filtration, ulta-filtration, eletrolysis or electrodialysis.

In step (b) the purified, neutralized liquid is subjected to an electric current and a separation means. The conversion of the salt to the acidic compound and the basis compound is promoted in step (b).

Accordingly, the main object of the present invention is the treatment of the neutralized liquid that is left after separation of the polysaccharide. The neutralized liquid is treated according to steps (a) and (b) described above in order to solve the problem of salt disposition which may not be environmentally desirable or feasible (page 1, last four lines and page 2, lines 1-4 of the Specification).

In the reasoning for the Final Rejection the Examiner stated: "...While the Warzecha et al. process is closely analogous to the applicants process, Warzecha et al differ from aplicant's process in that the separation of the polysaccharide ether is achieved by subjecting the neutralized reaction mixture to distillation instead of electrodialysis." (emphasis added)

Appellants agree with the Examiner that the Warzecha et al. process is closely analogous to steps (i) – (iv) of the process claimed in the patent application under Appeal.

However, Appellants respectfully submit that in the process of Warzecha et al. no separation of the polysaccharide ether (hydroxyethyl cellulose) is achieved by subjecting the neutralized reaction mixture to distillation. Warzecha et al. teach distillation of the neutralized reaction mixture after its separation from the hydroxyethylcellulose.

Also, as the Appellants have previously explained, the separation steps (a) and (b) of the process claimed in the patent application under Appeal relate to the treatment of the neutralized liquid that is left after the separation of the polysaccharide, but not to the separation or treatment of the polysaccharide.

In the reasoning for the Final Rejection the Examiner stated " ... Since Warzecha et al teach a process for producing a neutralized reaction mixture comprising a salt of the acidic compound and the basic compound of hydroxyethyl cellulose and Takahashi et al. teach a method of subjecting a cellulose ether sodium salt to electrolysis to convert it to the acid form, one skilled in the art would have a reasonable expectation for success in combining both references to accomplish the conversion of a polysaccharide ether salt to the acidic compound and the basis compound. ..." (emphasis added)

Appellants respectfully submit that this statement by the Examiner is incorrect in two points:

1. The neutralized reaction mixture that is subjected to distillation according to Warzecha's teaching does not contain a "salt of the acidic compound and the basic compound of hydroxyethyl cellulose". Distillation of the neutralized reacation mixture takes place after separation of hydroxyethyl cellulose from the neutralized reaction mixture. Moreover, the salt of the acidic compound and the basic compound is a simple salt, such as sodium acetate (page 5, line 2 of Warzecha s teaching) which has nothing to do with the hydroxyethyl cellulose.
2. The subject of the present invention is not to accomplish the conversion of a polysaccharide ether salt to the acidic compound and the basis compound. As explained above, steps (a) and (b) do not treat a polysaccharide ether but a liquid from which a polysaccharide ether previously had been separated.

Therefore, Appellants respectfully submit that the Examiner has based his Final Rejection on a wrong technical assumption. For this reason the Final Rejection is not sustainable and should be reversed.

Furthermore, Appellants submit that there is no motivation for theperson of ordinary skill in the art to combine the teachings of Warzecha et al. and of Takahashi et al. Warzecha et al addresses the problem of large amounts of salts, such as sodium acetate, left in the fluid used for scrubbing hydroxyethyl cellulose. Warzecha suggests to solve this problem by neutralizing the scrubbing fluid only after the separation of the hydroxyethyl cellulose. Warzecha et al. list on page 4, lines 9 and 10 the advantages of their process, e.g., that their process leaves the hydroxyethyl cellulose unchanged.

As explained further above, the main object of the present invention is the treatment of the neutralized liquid that is left after separation of the polysaccharide. Someone of ordinary skill in the art who is working on solving this poblem would not consider the teaching of Takahashi at all. Takahashi et al. do not even address the

problem that may be caused by a liquid that is left after the separation of the polysaccharide.

The Examiner indicated that the motivation for combining both references " ... is provided by Takahashi et al. which suggest the eletrodialysis step in the preparation of cellulose ether provides high yields and low pollution (page 4, 7th paragraph)." Indeed the teaching of Takahashi et al. relates to the conversion of a cellulose ether sodium salt into a corresponding cellulose ether salt with another cation, such as lithium, calcium, magnesium or aluminium.

However, Takahashi et al. do mention a salt-containing liquid that is left after the separation of the polysaccharide at all and even less provide a solution to the problem of disposing such liquids.

Applicants urge that it is improper to use the claimed invention as a template to piece together teachings of prior art so that the claimed invention is rendered obvious (In re Fritch 972 F.2d 1260, 1265, 23, U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992)). Since the Examiner's argumentation for the combinability of the two references relied on two incorrect technical assumptions, the Examiner has failed to show that someone of ordinary skill in the art would be motivated to combine the teachings of Warzecha et al. and Takahashi et al. Moreover, the references themselves contain no teaching to indicate the suitability of combining their teachings and there is no statement in the present record amounting to a clear and particular showing of the combinability of the two references (Winner Int'l Royalty Corp. v. Wang, 202 F.3d 1340 (Fed. Cir., 2000), *reh'g en banc denied,* (Fed. Cir., 2000); *cert. denied,* 120 S. Ct. 2679 (US 2000)).

Even if, for the sake of argumention, one would agree with the Examiner that one skilled in the art would have a reasonable expectation for success in combining both references to accomplish the conversion of a polysaccharide ether salt to the acidic compound and the basis compound, this expectation would not lead theperson of ordinary skill in the art to the process as claimed in the patent application under Appeal. As indicated above, the subject of the present invention is not to accomplish

the conversion of a polysaccharide ether salt to the acidic compound and the basis compound.

If, for the sake of argumention, someone of ordinary skill in the art would combine the teachings of Warzecha et al. and of Takahashi et al., the following process would result: Crude water-soluble hydroxyethyl cellulose containing alkali hydroxide is washed with a mixture of 50-70 vol.% methanol and 50-30 vol.% acetone or isopropanol. The washing fluid is neutralized with an acid and the neutralized washing fluid is subjected to distillation (process as taught by Warzecha). The hydroxyethyl cellulose is subjected to an electrodialysis as taught by Takahashi.

However, this is not the process claimed in any of the claims of the patent application under Appeal.

Moreover, Warzecha et al. and Takahashi et al. do not teach, neither taken separately nor in combination, subjecting the neutralized liquid - that is left after the separation of the polysaccharide - to two separation steps (a) and (b) of which the first separation step is conducted at an alkaline pH. On page 2, lines 16 – 20 of the specification filed by the Appellants the importance of the separation step (a) is explained. In this step organic solvents and residues of the polysaccharide are removed from the salt-containing stream in order to avoid fouling of the separation means, such as bipolar membranes, in the subsequent separation step (b).

For the reasons stated above the invention as claimed in independent Claims 33 and 50 and all claims dependent thereon is unobvious over Warzecha et al. in view of Takahashi et al.

Furthermore, Claims 39 – 43, 50 and 51 are separately patentable as unobvious over Warzecha et al. in view of Takahashi et al. Claims 39 – 43, 50 and 51 claim that the first separation (a) wherein the salt is separated from the organic solvent and the residue of the polysaccharide / cellulose is carried out by electrodialysis with a semipermeable membrane at an alkaline pH. Quite surprisingly, in accordance with the present invention, it has been found that by conducting the electrodialysis at an alkaline pH, the degree of fouling of the membrane can be

reduced and the ionic mobility of the salt through the membrane can be enhanced (page 2, last two lines, page 2, lines 1 and 2 and page 10, second paragraph of the specification).

Warzecha et al. and only teaches neutralization of the washing fluid with an acid and subjecting the neutralized washing fluid to distillation.

Neither Warzecha et al. nor Takahashi et al., taken separately or in combination, teach or suggest anywhere a process wherein:

after separation of the polysaccharide ether

(a) the neutralized liquid is subjected to a first separation by electrodialysis with a semi-permeable membrane at an alkaline pH to separate the salt from the organic solvent and the residue of the polysaccharide and provide a purified, neutralized liquid; and

(b) the purified, neutralized liquid is subjected to an electric current and a separation means effective to promote the conversion of the salt to the acidic compound and the basic compound.

Furthermore, Claims 40 – 42 and 51 are separately patentable as unobvious over Warzecha et al. in view of Takahashi et al. According to Claims 40 – 42 and 51 a pH is selected in the first separation (a) which is effective to inhibit the deposition of the residual of the polysaccharide or cellulose on the membrane.

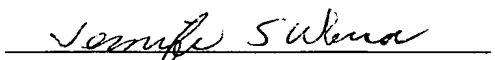
The comparison between Control Example 2 and Example 3 on pages 18 and 19 of the specification illustrates that deposition of the residual of the polysaccharide or cellulose on the membrane can be reduced and the ionic mobility of the salt through the membrane can be enhanced by selecting an alkaline pH.

As acknowledged by the Examiner, Takahashi et al. do not provide specific disclosures regarding the use variable pH's in the electrolysis process. Takahashi et al do not teach or suggest anywhere that deposition of the residual of the polysaccharide or cellulose on the membrane can be inhibited by selecting a certain pH.

CONCLUSION

Based on the above discussion Appellants respectfully submit that the invention as claimed in independent Claims 33 and 50 and all claims dependent thereon is unobvious over Warzecha et al. in view of Takahashi et al. Accordingly, Appellants urge this Honorable Board of Patent Appeals and Interferences to reverse the Final Rejection of the Examiner in respect to all claims in this application.

Respectfully submitted,



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APPENDIX

The Claims on Appeal

33. In a process for producing polysaccharide ethers comprising:

(i) treating polysaccharide with a basic compound to promote swelling of the polysaccharide;

(ii) reacting the polysaccharide with at least one derivatizing agent in a liquid medium comprising at least one organic solvent under conditions effective to promote a reaction between the polysaccharide and the derivatizing agent and form a reaction product comprising a polysaccharide ether, the basic compound and the organic solvent and a residue of the polysaccharide;

(iii) treating at least a portion of the reaction product comprising the basic compound with an acidic compound to provide a neutralized liquid comprising a salt of the acidic compound and the basic compound; and

(iv) separating the polysaccharide ether from at least one of the reaction product or the neutralized liquid:

The improvement which comprises:

(a) subjecting the neutralized liquid to a first separation at an alkaline pH to separate the salt from the organic solvent and the residue of the polysaccharide and provide a purified, neutralized liquid; and

(b) subjecting the purified, neutralized liquid to an electric current and a separation means effective to promote the conversion of the salt to the acidic compound and the basic compound.

34. The process of claim 33 which provides an acid product stream comprising the acidic compound.

35. The process of claim 33 which provides a base product stream comprising the basic compound.

36. The process of claim 33 further comprising utilizing at least a portion of the acid product stream in step (iii) of claim 1.

37. The process claim 33 further comprising utilizing at least a portion of the base product stream in step (i) of claim 1.

38. The process of claim 33 wherein said subjecting of the purified, neutralized liquid with the electric current is conducted in the presence of a bipolar membrane effective to provide a source of hydrogen and hydroxyl ions.

39. The process of claim 33 wherein the first separation is conducted by electrodialysis with a semi-permeable membrane.

40. The process of claim 39 wherein the pH is effective to inhibit the deposition of the residual of the polysaccharide on the membrane.

41. The process of claim 40 wherein the pH is greater than about 10.

42. The process of claim 41 wherein the pH is from 10.5 to 14.

43. The process of claim 41 wherein the electric current has a current density of from 500 to 2000 amps per square meter.

44. The process of claim 33 wherein the organic solvent is selected from the group consisting of acetone, ethanol, isopropyl alcohol, t-butyl alcohol, mono-, di, and triethylene glycol and mixtures thereof.

45. The process of claim 33 wherein the basic compound is selected from the group consisting of sodium hydroxide, potassium hydroxide, calcium hydroxide, magnesium hydroxide, lithium hydroxide, ammonium hydroxide and mixtures thereof.

46. The process of claim 33 wherein the acidic compound is selected from the group consisting of acetic acid, nitric acid, hydrochloric acid, sulfuric acid, phosphoric acid and mixtures thereof.

47. The process of claim 33 wherein the polysaccharide is selected from the group consisting of cellulose, starch, pectin, chitosan, chitin, agar, carrageenan, alginate, guar, arabic, tragacanth, xanthan gum and mixtures thereof.

48. The process of claim 33 wherein the derivatizing agent is an alkylene oxide and selected from the group consisting of ethylene oxide, propylene oxide, butylene oxide and mixtures thereof.

49. The process of claim 33 which further comprises derivatizing the polysaccharide ether with at least one cationic, anionic or hydrophobic substituent.

50. A process for producing cellulose ethers comprising:

(i) treating cellulose with a basic compound to promote swelling of the cellulose;

(ii) reacting the cellulose with at least one derivatizing agent in a liquid medium comprising at least one organic solvent under conditions effective to promote a reaction between the cellulose and the derivatizing agent and form a reaction product comprising a cellulose ether, the basic compound and the organic solvent and a residue of the cellulose;

(iii) treating at least a portion of the reaction product comprising the basic compound with an acidic compound to provide a neutralized liquid comprising a salt of the acidic compound and the basic compound; and

(iv) separating the cellulose ether from at least one of the reaction product or neutralized liquid:

The improvement which comprises:

(a) subjecting the neutralized liquid to a first separation by electrodialysis with a semi-permeable membrane at an alkaline pH to separate the salt from the organic solvent and the residue of the cellulose and provide a purified, neutralized liquid; and

(b) subjecting the purified, neutralized liquid to an electric current and a separation means effective to promote the conversion of the salt to the acidic compound and the basic compound.

51. The process of claim 50 wherein the pH is effective to inhibit the deposition of the residue of the cellulose on the membrane.

Footnote: It is noted that typographical errors have crept into line 2 of Claim 36 and line 2 of Claim 37. In each of Claims 36 and 37 the term " of claim 1 " should be replaced by -- of claim 33 --. However, these typographical errors are readily discerned so the claims have been reproduced as they presently stand.